

## AUXILIARY AXLE SYSTEM FOR CONCRETE PUMP TRUCK

### BACKGROUND OF THE INVENTION

5 The present invention pertains to an auxiliary axle system for concrete pumping trucks. Generally, concrete pumping trucks carry a pump that draws concrete out of a reservoir called a hopper and pumps concrete through a valve that feeds a pipeline carried by an expandable boom. Together, these components are capable of continuously moving a large volume of heavy, viscous material, such as concrete, considerable vertical or horizontal distances.

10 The gross weight of concrete pumping trucks has increased with advances in concrete pumping technology that have enabled concrete to be transported to higher or more distant locations. Due to the increased concrete pumping truck size and gross weight, access to roads with axle weight restrictions can be affected. Therefore, there is a need for concrete pumping trucks with an  
15 auxiliary axle system so that the concrete pumping trucks can meet the axle weight restrictions for all roads.

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## BRIEF SUMMARY OF THE INVENTION

A concrete pumping truck with a forward end, a rear end and a hopper attached at the rear end of the truck comprises an auxiliary axle system pivotally attached to the rear end of the truck adjacent the hopper. The auxiliary  
5 axle system comprises a pair of steerable wheels movable between a first position in contact with a ground surface and a second position elevated above the ground surface.

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### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a standard concrete pumping truck.

FIG. 2 is a perspective view of an auxiliary axle system attached to a truck frame and an outrigger support frame.

5                   FIG. 3 is a perspective view of the auxiliary axle system shown in FIG.2.

FIG. 3A is a side view of the auxiliary axle system adjacent to a hopper.

10                   FIG. 4 is an enlarged rear view of one half of the auxiliary axle system.

FIG. 5 is an enlarged perspective view of the hydraulic cylinder connection to the rearward connector arm.

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## DETAILED DESCRIPTION

The present invention is an auxiliary axle system that allows a concrete pumping truck access to roads with axle weight restrictions. FIG. 1 shows a perspective view of a typical concrete pumping truck 10. The concrete pumping truck 10 is capable of continuously moving a large volume of heavy, viscous material, such as concrete, considerable vertical or horizontal distances. The truck 10 carries a pump 12 that draws concrete out of a reservoir, or a hopper 14 that is located at the rear of the truck 10. The concrete is pumped through a valve (not shown) at the bottom of the hopper 14 to a pipeline 18 carried by an expandable boom 20, through the pipeline 18 and out an end hose 21. Outriggers A carried by truck 10 provide a stable base to allow boom 20 to extend some distance from the truck 10.

Due to the increased concrete pumping truck size and gross weight, access to roads with axle weight restrictions can be affected, which may inhibit or altogether preclude the concrete pumping truck 10 from reaching a job site. Therefore, there is a need for concrete pumping trucks with an auxiliary axle system so that the concrete pumping trucks 10 can meet the axle weight restrictions for all roads.

FIG. 2 is a perspective view of an auxiliary axle system 22 attached to truck frame rails 24 and an outrigger support frame 26 at the rear of the truck 10. The outrigger support frame 26, which is supported on and above the truck frame rails 24, carries and stores outriggers A (shown in FIG.1). The axle system 22 is attached to a rear end of the truck 10 adjacent to the hopper 14, which has been removed from FIG. 2.

The axle system 22 generally comprises a pair of wheels 26 that are pivotally mounted to a pair of spaced short axles 28, which are secured to and carried by a pair of rearwardly extending support arms 30. The support arms 30 are linked by a cross support member 32, which further carries two pairs of forward

extending attachment arms 34. The attachment arms 34 permit pivotal connection of the axle system 22 to the truck frame rails 24 of the truck 10 at the rear end of the truck 10. Hydraulic cylinders 36 connected at or near the intersection of the cross member 32 and each support arm 30 and connected to the outrigger frame 26 permit the axle system 22 to be raised and lowered according to the axle weight distribution requirements of the truck 10 and for backing up the truck 10. The spacing of the short axles 28 and the configuration and location of the cross support member 32 relative to support arms 30 allows the axle system 22 to be mounted and operated proximate to the hopper of truck 10.

FIG. 3 is an enlarged perspective view of the auxiliary axle system 22. As shown in FIG. 3, the pair of wheels 26 each include a standard steering pivot mount 29 (only one is shown) that connects wheels 26 to the end of the short axles 28 allowing wheels 26 to pivot when the truck 10 turns. A steering arm 39 is connected to each steering pivot mount 29 of the wheels 26. A tie rod 40 extends between the pair of wheels 26 and is connected to each of the steering arms 39 so that the pair of wheels 26 pivot in unison. As illustrated in FIG. 3, the tie rod 40 is shaped with spaced bends 41 to define two opposing end portions 40a, 40b and a central portion 40c, which permits the tie rod 40 to clear the hopper 14 when the axle system 22 is raised to a stored position.

Each of the short axles 28 are also connected to one of the support arms 30, such as by welding. The support arms 30 extend transversely from the short axles 28 in a forward direction relative to the truck 10. Each of the support arms 30 has a pair of mounting flanges 38 at the end opposite the connection to the short axles 28. The cross member 32 is connected to the pair of support arms 30 generally adjacent the mounting flanges 38 by welding. The cross member 32 has a length sufficient to space the wheels 26 from the hopper 14 and assist in the alignment of the wheels 26 with the wheels of the truck 10. The cross member 32 and the pair of support arms 30 collectively form a U-shaped frame that allows the

axle system 22 to be mounted and operated adjacent the hopper 14 (shown in FIGS. 1 and 3A). The axle system 22 includes a support plate 42 attached, for example by welding, to the cross member 32 and the pair of support arms 30 to provide reinforcement and support to the axle system 22.

5                   The two pair of attachment arms 34 extend forward relative to the truck 10 and are connected to the cross member 32 by welding. Each pair of attachment arms 34 includes a first arm 44 and a second arm 46 that are spaced for connection to the truck frame rails 24. The first arm 44 and the second arm 46 extend at an angle relative to the cross member 32 adequate to connect the axle  
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15                   As shown in FIG. 3, axle system 22 is secured to the truck 10 by a pair of mounting brackets 50. The mounting brackets 50 include a plurality of holes for connecting the mounting brackets 50 to the truck frame rails 24 (as shown in FIGS. 3A-5) by suitable fasteners, such as bolts. Welded to the mounting brackets  
20                   50 are bearing housings 48 containing bearings. The attachment arms 34 are secured to each side of the bearing housings 48 by a pivot pin 52 that is inserted through the bearing housings 48. A support 54 welded between the mounting bracket 50 and the bearing housing 48 strengthens the connection of the bearing housings 48 to the mounting brackets 50.

                    The pair of hydraulic cylinders 36 include a first end 56 connected  
25                   between the mounting flanges 38 of each support arm 30 by a retaining pin (not shown).

                    As shown in FIG. 3A, the second end 58 of the hydraulic cylinders 36 is connected to the outrigger support frame 26. The pair of hydraulic cylinders

36 are used to raise and lower the axle system 22 from a first position (lowered) to a second position (raised). Although the preferred embodiment includes a pair of hydraulic cylinders 36, a single hydraulic cylinder may also be employed. Further, while hydraulic cylinders 36 are shown connected to the support arms 30, connection may also be made to the cross member 32.

As further shown in FIG. 3A, hopper 14 typically is located relatively close to the ground at the rear of the truck 10. By locating the cross member 32 forward of the hopper 14 and utilizing the pair of spaced short axles 28, the axle system 22 is able to be stored in a raised position proximate the hopper 14. As previously discussed, the tie rod 40 is also shaped to accommodate the hopper 14 when the axle system 22 is in the raised and stored position.

FIG. 4 is an enlarged rear view of one half of the axle system 22. As shown in FIG. 4, the attachment arms 34 are connected to the truck frame rails 24 through the mounting plate 50. At the opposite end, the attachment arms 34 are welded to the cross member 32 at a location inset from the end 32a of the cross member 32. The support arms 30 are welded at or near the end 32a of the cross member 32. At the opposite end of the support arms 30, the axles 28 are secured to the support arms 30. The length of the axles 28 is selected to ensure that the wheels 26 of the axle system 22 generally align with the wheels of the truck 10.

The first end 56 of the hydraulic cylinder 36 is connected to the pair of mounting flanges 38 of the support arms 30. A pair of spacers 62 are attached between the mounting flanges 38 and the first end 56 of the hydraulic cylinder 36. The spacers 62 center the hydraulic cylinder 36 between the mounting flanges 38.

A second end 58 of the hydraulic cylinder 36 is secured to a support structure of the concrete pumping truck 10, which in one embodiment is the outrigger support frame 26. A plate 70 is mounted to a bottom surface of the outrigger support frame 26, and the second end 58 of the hydraulic cylinder 36 attaches to the plate 70. The second end 58 of the hydraulic cylinder 36 includes

a bushing 72 and a bar 74. To connect the second end 58 to the plate 70, the bar 74 is inserted through the bushing 72. The bar 74 is secured to the plate 70 by suitable fasteners, such as bolts 76.

5 A combination dampener/centering spring 60 is connected between the axles 28 and the tie rod 40. The combination dampener/centering spring 60 assists the wheels 26 to pivot to a straight position after a turn. The combination dampener/centering spring 60 also prevents the wheels 26 from shimmying when the axle system 22 is in a down and loaded position.

10 FIG. 5 is a further drawing illustrating the connection between the hydraulic cylinder 36 and the support arms 30. The first end 56 of the hydraulic cylinder 36 is connected to the mounting flanges 38. To connect the first end 56 to the mounting flanges 38, a pin 64 with a retainer plate 66 is inserted through a cylindrical hole within the mounting flanges 38 and holes in the spacers 62 aligned with the holes of the mounting flanges 38. A bolt 68 secures the retainer plate 66 to the mounting flanges 38 to secure the pin 64 in place.

15 The present invention permits an auxiliary axle system 22 to be mounted and operated at a rear end of a concrete pumping vehicle 10 by configuring a U-shaped frame that connects to the truck frame rails 24 and allows the wheels 26 to be positioned adjacent to the hopper 14. The wheels 26 of the auxiliary axle system 22 are steerable with the tie rod 40 configured to avoid the hopper 14 when the auxiliary axle system 22 is in the raised and stored position.

20 Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. The importance of the present invention is where the components are attached to one another to be able to accommodate the shape of the hopper.